

# NSCA & IFBB GENERAL PROGRAM DESIGN FOR SPORTS & REALISTIC PHYSICAL ACTIVITIES COMPARISON/CONTRAST

Here is a comparison and contrast of general program design principles and approaches between the NSCA (National Strength and Conditioning Association) and the IFBB (International Federation of Bodybuilding and Fitness) as applied to sports and realistic physical activities.

## NSCA Program Design Overview

The NSCA emphasizes a scientifically based, individualized approach to program design, rooted in evidence-based principles. Key aspects include:

- **Assessment and Goal Setting:** Programs begin with a thorough consultation, health history review, fitness assessment, and establishment of SMART (specific, measurable, achievable, relevant, time-bound) goals<sup>[1][2]</sup>.
- **Training Principles:** The NSCA highlights specificity, individuality, overload, progression, periodization, and reversibility as foundational principles<sup>[1][3][4]</sup>.
- **Program Components:** Training sessions typically include mobility/movement preparation, resistance training, cardiovascular work, core/stability training, and basic nutrition guidance<sup>[1]</sup>.
- **Application:** NSCA programs are designed to be adaptable for a wide range of clients, from athletes to general fitness enthusiasts, and are structured to meet specific performance or health goals<sup>[2][5]</sup>.
- **Periodization:** Training is often periodized (divided into phases such as off-season, pre-season, in-season) to optimize performance and reduce injury risk<sup>[2][3]</sup>.

## IFBB Program Design Overview

The IFBB, as the governing body for bodybuilding and fitness competitions, focuses on preparing athletes for specific competitive divisions. Key aspects include:

- **Sport-Specific Focus:** Programs are tailored to the demands of competition, emphasizing physique development, muscle symmetry, and stage presentation<sup>[6][7]</sup>.
- **Training Principles:** IFBB programming also values individuality, specificity, and overload, but places greater emphasis on hypertrophy, muscular endurance, and aesthetic outcomes<sup>[7]</sup>.
- **Program Components:** Training for IFBB competitors includes resistance training for muscle size and definition, cardiovascular work for fat loss, and strict nutrition protocols to achieve stage-ready conditioning<sup>[7]</sup>.
- **Application:** IFBB programs are highly specialized for contest preparation, with strict timelines and phases (bulking, cutting) to peak for competition<sup>[7]</sup>.
- **Regulations:** The IFBB provides detailed rules for competition categories, judging criteria, and event organization, but does not prescribe specific training templates—instead, it encourages adherence to general strength and conditioning principles as outlined in their academy guidelines<sup>[6][7]</sup>.

Comparison Table

| Feature             | NSCA  | IFBB  |
|---------------------|---|---|
| Focus               | Sport performance, general fitness, health              | Bodybuilding, physique, fitness competition                   |
| Assessment          | Comprehensive (health, fitness, goals)                  | Focused on physique, symmetry, and stage readiness            |
| Training Principles | Specificity, individuality, overload, progression, etc. | Specificity, individuality, overload, hypertrophy, aesthetics |
| Program Components  | Mobility, resistance, cardio, core, nutrition           | Resistance, cardio, nutrition, stage presentation             |
| Periodization       | Yes (phases for sport/health goals)                     | Yes (phases for contest prep: bulking, cutting)               |
| Target Audience     | Athletes, general population, fitness enthusiasts       | Competitive bodybuilders, fitness athletes                    |
| Regulations         | Guidelines for safe, effective training                 | Rules for competition categories, judging, and event conduct  |

## Contrast and Summary

- **Scope:** The NSCA's approach is broader, applicable to sports, general fitness, and health, while the IFBB's approach is specialized for physique and fitness competition<sup>[2][7]</sup>.
- **Assessment:** NSCA programs start with holistic assessments and goal setting, while IFBB programs are more narrowly focused on physique development and stage preparation<sup>[1][7]</sup>.
- **Training Emphasis:** NSCA programs emphasize performance, health, and injury prevention, whereas IFBB programs prioritize muscle size, symmetry, and aesthetic presentation<sup>[2][7]</sup>.
- **Program Design:** Both use periodization and individualized training, but IFBB programs are more rigid in their contest preparation timelines and nutritional protocols<sup>[7]</sup>.
- **Regulations:** The IFBB provides strict rules for competition, while the NSCA offers guidelines for training program design and safety<sup>[6][1]</sup>.

In summary, while both organizations value individualized, specific, and periodized training, the NSCA's focus is on broad-based athletic and health outcomes, whereas the IFBB's is on preparing athletes for competitive bodybuilding and fitness events.



## NSCA vs. IFBB Program Design: Sports vs. Realistic Physical Activities

### NSCA Approach

- **Sports:**  
The NSCA (National Strength and Conditioning Association) prioritizes evidence-based, individualized program design for athletes. For sports, NSCA programs focus on developing sport-specific qualities—such as speed, agility, power, and movement patterns—using periodized training that adapts throughout the sport season (off-season, pre-season, in-season)<sup>[8][9][10]</sup>. This includes:
  - o Assessments to determine athlete needs and goals

- o Specificity: Training tailored to the demands of the sport (e.g., footwork for soccer, explosive power for sprinters)<sup>[10]</sup>
- o Progression and periodization: Structured phases to peak at the right time<sup>[9]</sup>
- o Injury prevention and recovery strategies
- **Realistic Physical Activities:**  
 For general populations or realistic activities (daily living, recreational sports), NSCA programs emphasize foundational fitness—mobility, strength, endurance, flexibility, and functional movement—rather than sport-specific drills<sup>[8][10]</sup>. The focus is on:
  - o Improving overall health and fitness
  - o Addressing individual goals, limitations, and previous injuries<sup>[8]</sup>
  - o Enhancing quality of life and physical competency for everyday tasks

## IFBB Approach

- **Sports:**  
 The IFBB (International Federation of Bodybuilding and Fitness) does not primarily design programs for traditional sports performance. Instead, its focus is on physique sports—bodybuilding and fitness competitions—where the goal is muscular hypertrophy, symmetry, and aesthetics<sup>[11][12]</sup>. While some training may overlap with athletic preparation (e.g., strength and endurance), the emphasis is not on sport-specific skills or performance but on appearance and presentation.
- **Realistic Physical Activities:**  
 IFBB-style programs are less concerned with functional movement or realistic daily activities. Training is highly specialized for muscle development, definition, and stage readiness, often involving advanced resistance training, strict nutrition, and posing practice. These protocols may not directly translate to improved performance in sports or daily physical tasks.

## Key Differences

| Aspect | NSCA: Sports | NSCA: Realistic Activities | IFBB: Sports (Physique) | IFBB: Realistic Activities |
|--------|--------------|----------------------------|-------------------------|----------------------------|
|        |              |                            |                         |                            |

|                               |                                      |                                      |                                     |                                  |
|-------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|----------------------------------|
| <b>Primary Goal</b>           | Sport performance                    | Health, fitness, daily function      | Muscular size, symmetry, aesthetics | Muscle development, not function |
| <b>Training Focus</b>         | Sport-specific skills & conditioning | Foundational fitness & movement      | Hypertrophy, posing, fat loss       | Hypertrophy, aesthetics          |
| <b>Assessment</b>             | Individual needs, sport demands      | Individual needs, lifestyle          | Body composition, symmetry          | Body composition                 |
| <b>Periodization</b>          | Yes, for peak performance            | Yes, for progression and safety      | Yes, for contest prep               | Yes, for physique goals          |
| <b>Transfer to Daily Life</b> | High (functional, injury prevention) | High (mobility, strength, endurance) | Low (mainly appearance)             | Low (mainly appearance)          |

## Summary

- **NSCA programs** for sports are highly individualized and emphasize developing the specific physical and technical skills needed for athletic success, while for realistic activities, the focus shifts toward overall health, functional movement, and injury prevention<sup>[8][9][10]</sup>.
- **IFBB programs** are specialized for bodybuilding and fitness competition, prioritizing aesthetics and muscle development over functional or sport-specific performance, making them less applicable to either athletic performance or daily physical activities<sup>[11][12]</sup>.

This distinction means NSCA designs are more versatile and transferable to both sports and real-world physical demands, while IFBB designs are narrowly focused on competitive physique outcomes.

# Why does sport-specific training emphasize mimicking actual sport movements more than general fitness

Sport-specific training emphasizes mimicking actual sport movements more than general fitness because of the principle of specificity: the body adapts most effectively to the specific demands placed on it<sup>[13][14][15]</sup>. When athletes train using movements and drills that closely replicate those used in their sport, they develop neuromuscular patterns and muscle coordination that directly enhance their on-field performance<sup>[16][13][15]</sup>. This targeted adaptation leads to improvements in reaction time, precision, and efficiency for sport-specific actions<sup>[13][17]</sup>.

Additionally, sport-specific training strengthens the exact muscles and joints most used during competition, which not only boosts performance but also reduces the risk of injury by preparing the body for the unique stresses of the sport<sup>[15]</sup>. In contrast, general fitness programs focus on building foundational attributes like overall strength, endurance, and mobility, which support broad health and physical capability but do not directly translate to the specialized skills or movements required in a particular sport<sup>[17]</sup>.

In summary, sport-specific training is designed to maximize transferability to competition by closely mirroring the physical and technical demands of the sport, while general fitness aims for broad, non-specific physical improvements<sup>[16][13][15][17]</sup>.



## How does sport-specific training reduce injury risk by targeting relevant muscles and joints

Sport-specific training reduces injury risk by directly targeting the muscles and joints most involved in an athlete's sport, thereby enhancing their strength, stability, and resilience against the unique stresses of competition. Here's how this works:

- **Strengthening Relevant Muscles and Joints:** By focusing on the muscle groups and joint actions most frequently used in a sport, athletes can prevent strains,

sprains, and overuse injuries. For example, swimmers often strengthen their shoulders to guard against rotator cuff injuries, while runners target muscles around the knee to reduce knee injuries<sup>[18][19]</sup>.

- **Improving Muscle Balance and Joint Stability:** Sport-specific training addresses muscle imbalances that can place undue stress on joints. Balanced strength development ensures that no single muscle group overpowers another, which is crucial for joint alignment and stability—key factors in injury prevention<sup>[20][21]</sup>.
- **Enhancing Connective Tissue Strength:** Resistance and functional training not only build muscle but also strengthen ligaments, tendons, and cartilage. This increased resilience in connective tissues helps joints withstand repetitive or high-impact movements typical in sports, reducing the risk of tears and chronic injuries<sup>[22][21]</sup>.
- **Refining Body Mechanics and Technique:** Training that mimics sport movements reinforces proper biomechanics and neuromuscular coordination. This reduces the likelihood of injuries caused by poor technique or faulty movement patterns, such as improper running gait or landing mechanics<sup>[20][23]</sup>.
- **Increasing Flexibility and Range of Motion:** Sport-specific programs often include mobility and flexibility work tailored to the sport's demands, further protecting joints from stiffness and injury during dynamic actions<sup>[18][19]</sup>.

By systematically targeting the physical demands of a specific sport, athletes not only improve performance but also build a more injury-resistant body, making sport-specific training a critical component of both athletic development and long-term health<sup>[18][19][23]</sup>.

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## Sample NSCA Routine (Sport-Specific)

**Goal:** Strength and power for an athlete (e.g., soccer, basketball)

**Frequency:** 3 days/week

**Duration:** 45–60 minutes per session

| Exercise | Sets | Reps | Rest | Notes |
|----------|------|------|------|-------|
|----------|------|------|------|-------|

|                       |     |          |         |                                  |
|-----------------------|-----|----------|---------|----------------------------------|
| Power Clean           | 3-5 | 3-5      | 2-5 min | Focus on explosive movement      |
| Back Squat            | 3-6 | 3-6      | 2-5 min | 80-90% 1RM, full range of motion |
| Bench Press           | 3-6 | 3-6      | 2-5 min | 80-90% 1RM                       |
| Pull-Ups              | 3   | 8-10     | 1-2 min | Add weight if able               |
| Plank                 | 3   | 30-60 s  | 1 min   | Core stability                   |
| Agility Ladder Drills | 4   | 10-20 s  | 1 min   | Mimic sport footwork             |
| Cool Down/Stretch     | 1   | 5-10 min | —       | Static stretching                |

- **Progression:** Increase weight or reps as strength improves (use the "2 for 2" rule: if you can do two more reps than your goal for two sessions, increase the load)<sup>[24]</sup>.
- **Periodization:** Adjust volume and intensity based on season (higher volume in off-season, higher intensity in pre-season/in-season)<sup>[25][26]</sup>.

## Sample IFBB Routine (Bodybuilding/Physique)

**Goal:** Muscle hypertrophy and definition

**Frequency:** 5-6 days/week (body part split)

**Duration:** 60-75 minutes per session

| Day   | Exercise               | Sets | Reps  | Rest    | Notes                                 |
|-------|------------------------|------|-------|---------|---------------------------------------|
| Chest | Bench Press            | 4    | 8-12  | 60-90 s | Moderate weight, focus on muscle pump |
|       | Incline Dumbbell Press | 3    | 10-12 | 60-90 s |                                       |
|       | Chest Flyes            | 3    | 12-15 | 60-90 s |                                       |
| Back  | Pull-Ups               | 4    | 8-12  | 60-90 s |                                       |

|           |                    |   |       |         |  |
|-----------|--------------------|---|-------|---------|--|
|           | Barbell Row        | 4 | 8-12  | 60-90 s |  |
|           | Lat Pulldown       | 3 | 10-15 | 60-90 s |  |
| Legs      | Squats             | 4 | 8-12  | 60-90 s |  |
|           | Leg Press          | 3 | 10-15 | 60-90 s |  |
|           | Leg Extension/Curl | 3 | 12-15 | 60-90 s |  |
| Shoulders | Overhead Press     | 4 | 8-12  | 60-90 s |  |
|           | Lateral Raise      | 3 | 12-15 | 60-90 s |  |
| Arms      | Biceps Curl        | 3 | 10-15 | 60-90 s |  |
|           | Triceps Pushdown   | 3 | 10-15 | 60-90 s |  |

- **Progression:** Increase weight or reps as able, focus on muscle-mind connection and strict form<sup>[27][24]</sup>.
- **Rest:** Shorter rest periods to maximize muscle pump and hypertrophy<sup>[27]</sup>.
- **Duration:** Each session targets a specific muscle group for maximum volume and detail.

## Key Differences

- **NSCA routines** focus on strength, power, and functional movement for sports, with longer rest and lower reps at higher intensities<sup>[25][26][24]</sup>.
- **IFBB routines** emphasize hypertrophy, muscle symmetry, and definition, using higher reps, shorter rest, and greater training volume for each muscle group<sup>[27][24]</sup>.

Both regimens use progressive overload and periodization, but their structure, intensity, and exercise selection reflect their different goals and philosophies.



## Bodybuilding Routine for Bowling vs. Strength Training for Bowling

## Bodybuilding Routine for Bowling

### Purpose:

- Focuses on muscle hypertrophy (size and symmetry), not necessarily function or sport-specific movement.
- Emphasizes isolating muscle groups for aesthetics.

### Sample Routine (3-4 days/week):

| Muscle Group    | Exercise             | Sets | Reps  | Notes |
|-----------------|----------------------|------|-------|-------|
| Chest/Shoulders | Dumbbell Bench Press | 3    | 10-12 |       |
|                 | Lateral Raises       | 3    | 12-15 |       |
| Back            | Lat Pulldown         | 3    | 10-12 |       |
|                 | Seated Row           | 3    | 10-12 |       |
| Arms            | Biceps Curl          | 3    | 12-15 |       |
|                 | Triceps Extension    | 3    | 12-15 |       |
| Legs            | Squats               | 3    | 10-12 |       |
|                 | Leg Extensions/Curls | 3    | 12-15 |       |
| Core            | Crunches/Planks      | 3    | 15-20 |       |

- **Rest:** 60-90 seconds between sets.
- **Progression:** Add weight as you build muscle.
- **Goal:** Improve overall muscle size, symmetry, and definition.

## Strength Training for Bowling

### Purpose:

- Focuses on functional strength, stability, and endurance for bowling performance.
- Emphasizes compound, multi-joint movements and mimics bowling actions.

### Sample Routine (2-3 days/week):

| Focus Area         | Exercise                       | Sets | Reps/Duration | Notes  |
|--------------------|--------------------------------|------|---------------|--|
| Lower Body         | Squats/Lunges                  | 3    | 8-10          | Improves leg drive and stability <sup>[28][29][30][31]</sup> |
|                    | Chair Lunges                   | 3    | 10            | Mimics bowling slide <sup>[31]</sup>                         |
| Core               | Planks                         | 3    | 30-60 sec     | Enhances core stability <sup>[30][31][32]</sup>              |
|                    | One-Legged Floor Touches       | 3    | 8-10 per leg  | Balance and control <sup>[31]</sup>                          |
| Upper Body         | Half-Kneeling Push/Pull (band) | 3    | 10 per side   | Simulates bowling arm movement <sup>[32]</sup>               |
|                    | Light Overhead Dumbbell Press  | 3    | 8-10          | Shoulder stability <sup>[29][31]</sup>                       |
| Power/Coordination | Medicine Ball Throws           | 3    | 8-10          | Core and upper body power <sup>[29]</sup>                    |
| Mobility           | Dynamic Stretching             | —    | 5-10 min      | Prepares joints and muscles <sup>[30][31]</sup>              |

- **Rest:** 60-90 seconds between sets.
- **Progression:** Increase resistance or reps as strength improves.
- **Goal:** Enhance power transfer, balance, and injury prevention.

## Comparison Table

| Aspect                | Bodybuilding Routine for Bowling | Strength Training for Bowling                |
|-----------------------|----------------------------------|--|
| <b>Primary Goal</b>   | Muscle size and aesthetics       | Functional strength, power, and stability    |
| <b>Exercise Type</b>  | Isolation and compound lifts     | Compound, functional, and sport-specific     |
| <b>Movement Focus</b> | General muscle groups            | Mimics bowling actions and movement patterns |
| <b>Core Emphasis</b>  | Moderate                         | High (planks, anti-rotation, balance)        |

|                          |                                    |  |
|--------------------------|------------------------------------|--|
| <b>Progression</b>       | Add weight for hypertrophy         | Add resistance for functional strength         |
| <b>Transfer to Sport</b> | Low to moderate (general strength) | High (directly improves bowling performance)   |
| <b>Injury Prevention</b> | Not a primary focus                | Key focus (balance, mobility, joint stability) |

## Summary

- **Bodybuilding routines** for bowling build general muscle mass and symmetry, which may help with overall strength but do not directly target the specific movements or functional demands of bowling.
- **Strength training routines** for bowling are designed to enhance the precise muscle coordination, balance, and joint stability needed for optimal bowling performance, offering greater transfer to the sport and better injury prevention<sup>[28][29][30][33][31][32]</sup>.

For bowlers, a strength training approach that mimics the sport's demands is generally more beneficial for performance and longevity than a traditional bodybuilding regimen.



## Detailed Examples: Bodybuilding vs. Strength Training Routine for Bowling

### Bodybuilding Routine for Bowling

**Purpose:** Build muscle size and symmetry, not specifically tailored to bowling performance.

#### Sample Weekly Split (3-4 Days/Week):

##### Day 1: Chest & Shoulders

- Dumbbell Bench Press: 4 sets x 10-12 reps
- Incline Dumbbell Flyes: 3 sets x 12 reps

- Seated Shoulder Press: 3 sets x 10 reps
- Lateral Raises: 3 sets x 15 reps

### **Day 2: Back & Arms**

- Lat Pulldown: 4 sets x 10-12 reps
- Seated Cable Row: 3 sets x 12 reps
- Barbell Curl: 3 sets x 12 reps
- Triceps Rope Pushdown: 3 sets x 15 reps

### **Day 3: Legs & Core**

- Squats: 4 sets x 10 reps
- Leg Press: 3 sets x 12 reps
- Leg Extension: 3 sets x 15 reps
- Hamstring Curl: 3 sets x 15 reps
- Plank: 3 x 45 seconds

**Rest:** 60-90 seconds between sets

**Progression:** Increase weight as strength improves

**Focus:** Overall muscle development, not movement patterns specific to bowling

## **Strength Training Routine for Bowling**

**Purpose:** Enhance functional strength, stability, and movement patterns directly related to bowling.

### **Sample Routine (2-3 Days/Week):**

#### **Warm-Up:**

- Dynamic stretching (shoulders, hips, hamstrings): 5-10 minutes

#### **Main Exercises:**

- **Squats (Pyramid Sets):**  
4 sets: 10 reps, 8 reps, 6 reps, 4 reps (increase weight each set)  
*Builds leg power and stability for approach and slide<sup>[34]</sup>.*

- **Power Snatches (Pyramid Sets):**  
4 sets: 10 reps, 8 reps, 6 reps, 4 reps  
*Develops explosive power for delivery<sup>[34]</sup>.*
- **Lunges:**  
2 sets x 12–16 reps  
*Strengthens thighs and glutes, mimics bowling step<sup>[34][35]</sup>.*
- **Half-Kneeling Push/Pull with Resistance Band:**  
3 sets x 10 reps per side  
*Simulates holding and delivering the ball, improves core and shoulder stability<sup>[36]</sup>.*
- **One-Legged Floor Touches:**  
3 sets x 10 reps per leg  
*Improves balance and single-leg strength, crucial for the slide and finish<sup>[35][36]</sup>.*
- **Plank:**  
3 sets x 30–60 seconds  
*Core stability for posture and control<sup>[35][36]</sup>.*

#### Cool Down:

- Arm and shoulder stretches (tricep stretch, shoulder circles, etc.): Hold each for 30–50 seconds  
*Improves flexibility and range of motion, reduces injury risk<sup>[34]</sup>.*

**Rest:** 60–90 seconds between sets

**Progression:** Increase resistance or reps as strength and stability improve

### Key Differences Highlighted

| Aspect               | Bodybuilding Routine                    | Strength Training for Bowling                       |
|----------------------|---|---|
| <b>Goal</b>          | Muscle size, symmetry, aesthetics       | Functional strength, balance, injury prevention     |
| <b>Exercise Type</b> | Isolation and general compound lifts    | Compound, functional, bowling-specific movements    |
| <b>Transfer</b>      | Low to moderate for bowling performance | High—directly improves bowling skills and stability |

|                    |                             |   |
|--------------------|-----------------------------|---|
| <b>Core Focus</b>  | Moderate                    | High                                    |
| <b>Progression</b> | Weight/reps for hypertrophy | Resistance/reps for functional strength |

### In summary:

Bodybuilding routines build general muscle mass and symmetry, while bowling-specific strength training targets the muscles, movement patterns, and stability needed for better performance and injury prevention on the lanes<sup>[34][35][36]</sup>.



1. [https://www.nscs.com/contentassets/8323553f698a466a98220b21d9eb9a65/foundationsoffitnessprogramming\\_201508.pdf](https://www.nscs.com/contentassets/8323553f698a466a98220b21d9eb9a65/foundationsoffitnessprogramming_201508.pdf)
2. <https://us.humankinetics.com/products/nscas-guide-to-program-design-2nd-edition>
3. <https://www.sportshealthnorthwest.com/blog/principles-to-follow-in-sports-training>
4. <https://creatept.com/blogs/principles-of-fitness-training/>
5. [https://books.google.com/books/about/NSCA\\_s\\_Guide\\_to\\_Program\\_Design.html?id=hkcSEQAAQBAJ](https://books.google.com/books/about/NSCA_s_Guide_to_Program_Design.html?id=hkcSEQAAQBAJ)
6. <https://www.ifbb.com/wp-content/uploads/2018/02/IFBB-General-Rules-2018.pdf>
7. <https://www.ifbbacademynordic.com//designin-a-exercise-program-the-basic-principles-and-recommendations/>
8. [https://www.nscs.com/contentassets/8323553f698a466a98220b21d9eb9a65/foundationsoffitnessprogramming\\_201508.pdf](https://www.nscs.com/contentassets/8323553f698a466a98220b21d9eb9a65/foundationsoffitnessprogramming_201508.pdf)
9. <https://www.nscs.com/education/articles/kinetic-select/application-of-program-design-to-training-seasons/>
10. <https://sustainptperformance.com/sport-specific-training-vs-strength-and-conditioning/>
11. sports.fitness
12. education.fitness\_certification
13. <https://www.stack.com/a/the-importance-of-training-sports-specific-movements-skills/>

14. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9680266/>
15. <https://nptiflorida.edu/what-is-sport-specific-training-understanding-its-benefits-for-athletes/>
16. <https://www.gantrykids.com/maximizing-on-field-performance-the-importance-of-sport-specific-strength-training>
17. <https://sustainptperformance.com/sport-specific-training-vs-strength-and-conditioning/>
18. <https://nptiflorida.edu/what-is-sport-specific-training-understanding-its-benefits-for-athletes/>
19. <https://www.eastsideidealhealth.com/the-benefits-of-sports-specific-training/>
20. <https://sportsmedrockies.com/the-role-of-strength-training-in-preventing-sports-injuries/>
21. <https://www.svetness.com/blogs/strength-training-reduces-injury-risk>
22. <https://pubmed.ncbi.nlm.nih.gov/3633121/>
23. <https://www.gantrykids.com/maximizing-on-field-performance-the-importance-of-sport-specific-strength-training>
24. <https://www.ptpioneer.com/personal-training/certifications/nsca-cpt/nsca-cpt-chapter-15/>
25. <https://www.nsca.com/education/articles/kinetic-select/preparatory-period/>
26. [https://www.nsca.com/contentassets/8323553f698a466a98220b21d9eb9a65/foundationsoffitnessprogramming\\_201508.pdf](https://www.nsca.com/contentassets/8323553f698a466a98220b21d9eb9a65/foundationsoffitnessprogramming_201508.pdf)
27. <https://www.nerdfitness.com/blog/the-correct-number-of-reps-per-set-in-the-gym/>
28. <https://www.verywellfit.com/weight-training-bowling-exercises-3498721>
29. [https://www.reddit.com/r/Bowling/comments/10casei/workouts\\_to\\_improve\\_my\\_bowling/](https://www.reddit.com/r/Bowling/comments/10casei/workouts_to_improve_my_bowling/)
30. [https://www.somi.org/sites/default/files/resources/Training\\_Guide\\_-\\_Bowling.pdf](https://www.somi.org/sites/default/files/resources/Training_Guide_-_Bowling.pdf)
31. <https://fitbowler.com/bowling-strength-training/>
32. [https://www.youtube.com/watch?v=UZ\\_fUNuhQnA](https://www.youtube.com/watch?v=UZ_fUNuhQnA)
33. <https://richmond40bowl.com/bowling-and-weightlifting-a-cross-training-guide-for-bowlers/>
34. <https://www.exercise.com/workout-plans/bowling-workout-plan/>

35. <https://fitbowler.com/bowling-strength-training/>

36. [https://www.youtube.com/watch?v=UZ\\_fUNuhQnA](https://www.youtube.com/watch?v=UZ_fUNuhQnA)